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February 8-9, 2006

Ronald Reagan Building and International Trade Center
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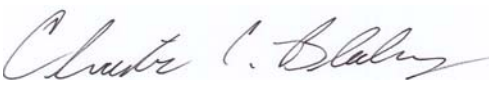
MEETING MINUTES



Christopher C. Blackerby
Executive Director

Harrison H. Schmitt
Chair

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MEETING REPORT
TABLE OF CONTENTS

Meeting Report Prepared By:
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Wednesday, February 8

Welcome and Opening Remarks
Senator Harrison H. Schmitt, Chair of the NASA Advisory Council (the Council) called the meeting to order at 2:00 pm and welcomed Council members and meeting attendees. He noted that all of the background from the first meeting is available on the Council Web site, including the meeting minutes, presentations, and pictures. He requested that any questions on this material be directed through the Council's Executive Director, Mr. Christopher Blackerby. The Chairman then noted that the meeting is open to the public and being held in accordance with the Federal Advisory Committee Act (FACA).

Senator Schmitt recognized several members who were not available at the last meeting: Dr. Charles Kennel; Dr. Mark Robinson; Dr. Eugene Covert; and Ms. Joann DiGennaro. He further noted than since the last meeting, the Council Committees have worked to better understand the NASA programs and several of the Committees have heard from NASA's senior executives. At this meeting, the Committee Chairs will brief the Council on what they have learned and bring recommendations forward for deliberation.

Overview and Discussion of Program Analysis and Evaluation
Senator Schmitt introduced Dr. Scott Pace, Associate Administrator for Program Analysis and Evaluation (PA&E), who provided an overview of the PA&E organization and its activities. The role of PA&E is fairly simple. It has many of the same characteristics of the PA&E at the Department of Defense (DOD). It provides independent analysis to better support key Agency decisions. The organization includes Studies and Analysis, Cost Analysis, Strategic Investments, Organizational Readiness, Independent Program Assessment, and Mission Support.

NASA's credibility is dependent on resources that align with NASA's strategic direction. The Agency is a project-oriented organization, and even large programs are "projectized." However, the Exploration Vision is a long venture, integrated over a long period of time. PA&E is necessary because of the changing nature of NASA. First and foremost, the objective of PA&E is to support a culture of objective analysis in NASA's senior decision-making. This strengthens both the programmatic side and the institutional side of the Agency.

PA&E plays a significant role in NASA's Planning, Programming, and Budget Execution System (PPBES) through its objective analysis at many points within the cycle. Tools include economic analyses, engineering analyses, cost analyses, and portfolio analyses. The independent cost estimates should be used for the budget estimates. The actual budgeting is more of the Chief Financial Officer's (CFO's) job. The CFO also follows budget execution,

but PA&E has a role at the end of the cycle in monitoring performance, and then factoring this back into decisions on strategic direction and budget programming.

The standard Air Force models are used in cost estimation. The Programs do individual component analyses. In response to a question from the Chairman, Dr. Pace responded that the way to deal with historical "mistakes" and to learn lessons is to look at project phasing, consider the Program arguments, and be conservative. In response to a question regarding up-to-date models and algorithms, Dr. Pace agreed that PA&E looks at the technical differences. He noted that PA&E is keeping track of the changes that the DOD is making in its tools and analyses.

Dr. Pace discussed some ongoing PA&E studies that have had an impact across the entire Agency or have broad strategic directions. These studies have included special assessment on the James Webb Space Telescope (JWST); funds distribution (one of the major issues at field Centers); exploration safety architecture; research and technology; managing recurring costs for sustainability; options for space communications; lunar robotic exploration architecture; and review of the Commercial Crew Cargo Project. He also noted some ongoing studies that are directed to more specific areas. In response to a question, Dr. Pace indicated that his organization is looking at tools--process standardization, configuration control, etc. Configuration control is particularly important, and PA&E is working toward getting a better handle on it.

Dr. Pace showed how PA&E contributes in the program/project lifecycle. The Planning, Programming, Budgeting, and Execution System (PPBES) is an evolution of a process in NASA that has been underway for some time. PA&E tries to answer a lot of the strategic questions up front. One of the aspects of this is separating direct costs from indirect costs, i.e., overhead and G&A. Center Directors are responsible for indirect costs, and Program Managers are responsible for direct costs. The PPBES tries to achieve controlled configuration for the budget, and make sure that resources line up with the architecture and the strategic priorities.

One of the important PA&E tools is Erasmus. It is a work-in-progress toward achieving a single, Agency-wide performance information system. Currently, the system can be used to get a sense of where the programs are. However, Erasmus is presently unsatisfactory for performance monitoring and decision making due to data entry labor (it is very data intensive) and unclear data definitions and standardization. Further, Erasmus only has a subset of the performance metrics needed to inform strategy and budget decision-making. To address challenges and fulfill its role, changes are needed in functionality (e.g., automated data updates), content (technical, programmatic, financial), and analytics (e.g., relating data from disparate databases). For example, the technical work breakdown structure tracking number must be linked to a unique project number that identifies a financial structure.

The comment was made that if NASA was successful with the design and implementation with the Erasmus tool, it should be brought to other federal agencies such as DOD. In response to this comment, Dr. Pace indicated that where NASA differs from DOD is in

size—NASA is small compared to DOD. Where NASA and DOD are similar is in the diversity of transactions and activities undertaken. A single tool/system like this may work for NASA but not necessarily DOD. Senator Schmitt asked why we go to these systems when in the past you could pick up the phone and call an expert to tell you where things were. In response to this comment, Dr. Pace noted that the space business is much more diverse than it was during Apollo. Getting everybody onto the same page is much harder. But a single database that holds the performance data for NASA will probably be inadequate, so there will be a need to share databases. Erasmus will have to be designed to account for this. The question is: What is the right thing to be measuring? Part of the challenge is keeping the connection between Washington and what happens on the shop floor, both at the Centers and with contractors.

There will always be creative tension between PA&E and the Mission Directorates. PA&E is the "executive secretary" for each of the Management Councils (Strategic, Program, and Operations). However, PA&E should never chair those entities or have in-line authority. In response to a question from Mr. Hanisee, Dr. Pace indicated that he would characterize core financial (the authoritative data source for the Agency) as accurate and good; however, there is not a direct feed from core financial into Erasmus.

Gen. Abrahamson commended Dr. Pace and his staff on their efforts. There are some worries, however. As cost models are validated, there must be interaction with contractors to get information. On the other hand, if there is too much interaction, the contractors will know PA&E models well enough to affect how proposals are put together. The question is how this particular attention is handled. Dr. Pace indicated that if PA&E can make progress in populating databases, PA&E will not have to cross over onto the contractor side. PA&E needs to get information that is already there out of current performers (the Centers). It cannot cross the line and ask companies for proprietary data. In response to a question, Dr. Pace indicated that independent cost estimates from PA&E are put into the budget, but that budget numbers will often be different than the cost numbers.

Senator Schmitt noted that several of the Committees would need to get more information from the PA&E group. Dr. Pace indicated that he and his people would be available to work with the Council Committees.

Dr. Pace indicated that in the last month or so, PA&E has produced some valuable outcome data. At the top level, he pointed to the Exploration System Architecture Study (ESAS). Defining that has been the signature accomplishment of the last year. Another set of analyses was related to the minimum number of Shuttle flights necessary to complete the Station. Out of some of the ESAS studies, PA&E took a look at nuclear power and from that work came the decision that NASA would not fund a major reactor program. Senator Schmitt observed that these are good examples of how the PA&E function can be valuable.

In response to a question, Dr. Pace indicated that the balance of inside and outside work would depend on the specific situation. The cost people and budget people should have 20-30 years experience. Studies and analysis people should be more cyclical. Independent program assessment should include people who have been around hardware recently.

Senator Schmitt noted that the Executive Secretaries of the Committees would be back in touch to schedule meetings with PA&E people.

Overview and Discussion of Commercial Opportunities and the Vision for Space Exploration

Mr. Brant Sponberg, Acting Program Executive for Innovative Procurements in the Exploration Systems Mission Directorate (ESMD), gave a presentation on commercial opportunities in the Vision for Space Exploration. He discussed the Commercial Crew/Cargo Project, the Centennial Challenges Program, and Suborbital activities. The national direction relative to commercialization exists in several documents. Space transportation and low Earth orbit (LEO) access are cited specifically. He briefly described some commercial opportunities and potential future markets. Commercial instruments include service contracts, funded Space Act agreements, prize competitions, and non-reimbursable Space Act agreements.

Senator Schmitt noted that historically, NASA has had a liberal policy of licensing the intellectual property to the contractors. Mr. Sponberg responded that in the grants area, intellectual property generally follows the grants. There are a number of tools that could be used to liberalize intellectual property and NASA always has the option to license. Mr. Sponberg did note, though, that he does not have a broad background in the area of intellectual property, and recommended that if the Council was interested in a broad discussion of the subject at NASA, the General Counsel's office would be the appropriate office at which to request a briefing.

The Announcement for the Commercial Crew/Cargo Project is on the street and the Project is currently in "blackout" phase. Mr. Sponberg noted that any information disseminated today is information that is already in the public domain. He emphasized that the Announcement is the controlling document over anything presented at this meeting.

In the first phase, NASA will enter into Funded Space Act Agreements. The arrangements will be a fixed-price, arms-length type of instrument. The Announcement solicits proposals for Earth-to-orbit spaceflight demonstrations of any combination of the following capabilities: external (unpressurized) cargo delivery and disposal; internal (pressurized) cargo delivery and disposal; internal cargo delivery and return; and crew transport. After successful demonstration of any mission capability under Phase 1, NASA will competitively procure orbital transportation services under commercial services contracts. NASA hopes to have more than one agreement for each demonstration, but that will depend on the proposals received and the cost. Some of the demonstrations may occur before 2010. Mr. Sponberg showed the summary performance goals for Phase 1.

NASA is asking for an end-to-end service. In response to a comment, Mr. Sponberg agreed that industry will propose what it considers to be commercially viable for a transport model. He showed a list of frequently asked questions on the Project. Foreign content is allowable, consistent with US law and policy. Cost sharing (private investment) is allowed, but financial risk will be evaluated during the selection process. Proposals can use existing

solutions or propose new solutions, consistent with the Station integration and interface requirements document. Companies can propose demos against one, some, or all cargo capabilities.

NASA is budgeting $500 million through FY 2009 for Phase 1. In response to a question, Mr. Sponberg noted that Dr. Griffin has indicated that he must have a government solution to these capabilities, i.e., the Crew Exploration Vehicle (CEV). However, he has also stated that if someone comes along with the right solution (a CEV variant), NASA would "stand down" on the CEV for Station and use the commercial service to satisfy the requirements. Proposals are due March 3, 2006, and awards are targeted for June 6, 2006. Ninety companies have demonstrated interest in the Announcement. NASA is bringing a support contractor to the evaluation team and advisors to the source selection official.

Centennial Challenges are prize competitions supporting space exploration and ongoing NASA priorities. This program builds on the Longitude Prize, early aviation prizes, the X Prize, and the DARPA Grand Challenge. The competitions are open to non-federal teams led by US citizens or organizations. It provides a tool for reaching into sectors that NASA cannot reach through contracts and grants. The best prize competitions will typically see teams spend multiples of the actual prize money itself. There are a number of different types of prizes, ranging from full-up space missions to technology priorities. Mr. Sponberg briefly showed how the program is formulated. Prize concepts come from a variety of sources. The best prizes usually involve follow-on opportunities or prestige. He noted some of the funded Alliance Prizes. NASA has tried to partner with a collaborating organization to administer each of the prizes. Two prize competitions have already been conducted: wireless power transmission and high strength-to-weight materials. There were no winners in this first round, but there was a huge public interest in the competition and new ideas were brought forward.

The NASA Authorization Act of 2005 provides legal authority to conduct larger (over $250K) prize competitions. There is a range of prizes in different areas. Most deal with exploration or crosscutting capabilities, e.g., fuel depot demonstration, micro-reentry vehicle, human lunar all-terrain vehicle, low-cost space pressure suit, lunar lander analog, and non-toxic rocket engine. These prizes are in the $5 million or less range. A couple of much larger prizes are under study: a human orbital vehicle flight (a 3-person, Gemini-like capability), and lunar robotic landing. Results for the human orbital vehicle flight seem to center on a $100 million to $150 million purse.

Mr. Sponberg discussed a couple of Suborbital activities that are being pursued: Recoverable Microgravity Flight Service Pathfinders and the Innovative Partnerships Program (non-reimbursable Space Act agreements for technology transfer or other resource sharing). He referred Council members to some Websites for further information on the Commercial Crew/Cargo Project and the Centennial Challenges Program. Mr. Sponberg indicated that he would be interested in hearing back from the Council on any other commercial opportunities that NASA should be paying attention to, as well as how NASA could better structure its activities to stimulate and leverage the private sector over the long-term.

Dr. Logsdon suggested a briefing or more information on In-Q-Tel, and Senator Schmitt suggested that Mr. Blackerby follow up on this and get something out to the members as background material. In response to a question, Mr. Sponberg indicated that NASA would be open to partnerships with other entities for funding some of the prizes. Dr. Kennel noted that certain areas of the prize competition might elicit participation of groups that don't normally work with NASA, e.g., the nanotechnology sector. Many of the technologies developed for other applications (e.g., medical) might be captured in the prize competitions. NASA also continues to work on developing prize competitions for space, Earth, and microgravity science applications as well as aeronautics**.** Mr. Sponberg indicated that he hopes to delve into some of the science prizes in the next fiscal year. His group has also looked at breakthrough techniques for telescope instrumentation. Gen. Lyles noted that the President's Commission addressed the entire NASA portfolio for prizes, including science and aeronautics. Mr. Sponberg agreed that there are all types of aircraft technologies that could be pursued through prizes. With respect to total funding for prizes, there was $2 million in 2004 and $10 million in 2005. There is $10 million in 2007 and $10 million in 2008. Dr. Huntress urged Mr. Sponberg to keep any prizes related to innovative space instrumentation very broad. He also suggested looking at something for advanced electrical propulsion. Mr. Sponberg agreed that there is a lot in the science area that could be mined for prizes. The Council offered other prize ideas, e.g., biomedical prizes, such as pharmaceutical countermeasures. Senator Schmitt requested that any other suggestions for briefings should be passed on to Mr. Blackerby.

Dr. Colladay suggested some further Council interaction relative to the Commercial Crew/Cargo Project when NASA can talk more freely about the project, i.e., after award in June.

Senator Schmitt adjourned the meeting for the day at 5:08 p.m.

Thursday, February 9

Senator Schmitt called the meeting to order at 8:00 am. He thanked the members of the various Council Committees as well as NASA personnel in getting up to speed on their areas of responsibility. The Chairman announced that the next meeting, May 17-18, 2006, will be held at the Jet Propulsion Laboratory (JPL) rather than at the Johnson Space Center (JSC). The Administrator will be at JPL during that time and thus will be able to meet with the Council.

Science Committee Report and Discussion

Dr. Charles Kennel, Chair of the Science Committee, reported on the Committee's activity since the last meeting. There were some excellent interactions with the Science Mission Directorate (SMD), and he thanked Associate Administrator, Dr. Mary Cleave, Deputy Associate Administrator, Dr. Colleen Hartman, and all of the SMD staff. The major issue was the $3.1 billion reduction in the science budget run-out. He noted that many of the specific concerns would be discussed in much greater detail after the Subcommittees examine the impact of the budgetary changes. Senator Schmitt indicated that he would do

everything that he could to accelerate the establishment of the Science Subcommittees. Dr. Kennel provided a top-level view of the impacts on general science. The first thing that was significant was the 15% reduction in the Research and Analysis (R&A) program, which prepares the groundwork for future missions. There was a special cut of 50% to the astrobiology R&A. The rationales for these reductions have not yet been delineated. The other aspect of the budgetary change is that there have been missions that were cancelled, deferred, or sent to further review. For example, Stratospheric Observatory for Infrared Astronomy (SOFIA) is under review; the Space Interferometry Mission (SIM) is delayed; the Mars program was reduced significantly; and Europa and Terrestrial Planet Finder (TPF) were deferred indefinitely. Dr. Kennel showed SMD's plan for mission launches from 2005 through 2013. He noted that these missions in the launch queue resulted from financial investments that were made about five years ago, and planning initiatives that started five years before that. If these missions are successful, they will continue to provide good news in the public arena for NASA.

Much of the scientific community sees these cuts, reviews and delays as a reduction in the opportunities for new flights. The Science Committee advises using the period 2006 – 2010 for planning for post-2010. Absent this planning process, the community will see an irreversible decline in opportunity.

Dr. Kennel presented the broad advice of the Science Committee: 1) rely on the Administrator's assurance of stability, enabling the science community to plan; 2) adopt a future-oriented view; and 3) continue to engage the science community from the bottom-up. The science community may endure the near-term if they see it in the longer context of a bottleneck from which NASA and the community will emerge into a brighter future. The planning exercise should look at three timeframes, involving the community in each phase: 1) now through 2010—get through the bottleneck and protect the most essential assets; 2) 2010 through 2020—plan an aggressive general science and lunar science program; and 3) 2020 and beyond—consider science infrastructure on the Moon and beyond, including new technologies.

Dr. Kennel indicated that the Science Committee discussed how to bring young researchers through the initial bottleneck and it recommends a re-examination of the R&A Program. Dr. Kennel noted that NASA should develop optons for a top to bottom restructure of the R&A program that is future oriented. The Program should look toward interesting science opportunities beyond 2010 and should emphasize younger scientists. The Committee believes that when SMD takes a cut, every element should be re-examined. In the next budget cycle, SMD should consider how it would rebalance the R&A Program to create an increase in funding levels above FY07 projections. In response to a question from Senator Schmitt, Dr. Kennel indicated that there was no dissenting opinion within the Committee on these recommendations.

Dr. Levy observed that there is an erroneous perception that if the number of missions decline, R&A must go down. The mission of the Agency is to expand knowledge through space capability and technology. In order for the Agency to carry out that mission, it is essential that there be a stable and robust R&A Program that has continuity independent of

the missions. Senator Schmitt indicated that the Science Committee could be more specific as the budget process progresses and encouraged a continuing look at this issue. Dr. Fisk added that the Committee advice is twofold: 1) rebalancing; and 2) more immediate action to examine the R&A Program in its current reduced state to ask whether funds are being spent in such a way as to plan for the future and protect assets. There needs to be some social engineering on NASA's part to focus the Program to protect the next generation and lay down the foundation for future missions. Dr. Kennel clarified that the recommendations do not come from any complaints about the R&A Program; rather, they come from the view that the R&A Program has not been re-examined in great detail as part of the normal budget or review processes within SMD.

The Committee had two broad recommendations on lunar science planning: 1) NASA should create a Science and Engineering Working Group for the Robotic Lunar Exploration Program; and 2) NASA should work with the National Research Council (NRC) to create a long term vision and conceptual plan for both robotic and human lunar science.

The Science and Engineering Working Group should be established as soon as possible. It should consider both the science and engineering aspects for any proposals that emerge, and encourage science and engineering to work together. In response to comments, Dr. Kennel clarified that this Working Group would include NASA people, portions of the Science Subcommittees, and other members of the science community. It would start with the robotic program. Dr. Huntress observed that the scientists would focus on what would get done; the engineers would focus on how it would get done. Dr. Kennel added that the fundamental principle is that scientists, engineers, and program people should work together from the earliest phase. Dr. Fisk noted that there is a need to have a stronger science involvement in the early robotic missions, and the strategy must be addressed prior to the start of the human phase. Senator Schmitt observed that there was a general consensus that a Science and Engineering Working Group approach would be valuable and should be done, but that it would be worthwhile to use the Council Science Subcommittee structure as a way to lead the outside community into the Working Group. Conceptually, it should eventually include the human side. Dr. Kennel agreed to clarify the wording of the recommendation. Senator Schmitt observed that the Working Group would eventually focus discussion on human missions, and it will have to think about the implications of robotic missions for human exploration.

Dr. Kennel addressed the second recommendation—a recommendation to work with the NRC over the next 18 months to address the long-term vision, as well as some of the shorter term goals. The Science Committee suggested that the NRC be requested to do a comprehensive study on lunar science, with early deliverables, and present to NASA a number of fairly broad goals for what lunar science might accomplish through 2020. These recommendations would be a guiding document for NASA to design a workshop. The early response (in the fall of 2006) would be an interim report on the robotic lunar exploration program. Senator Schmitt added that during this time, a conceptual design on lunar landing vehicles would be going forward. Dr. Kennel noted that what is needed in this area is an ongoing dialog in which the NRC study would be the first stage. After the NRC has done its initial assessment, NASA and the Council should hold a large workshop on lunar science

and engineering. The NRC would be present as an observer and receive the output of the workshop for its ongoing study. The NRC study document could provide guidance for future planning and would be the major foundation of lunar science in the Exploration context. This is consistent with philosophy cited in the Aldridge report to support long-term exploration goals. Dr. Logsdon noted that Mr. Doug Cooke in ESMD is in charge of the lunar planning effort, and the efforts recommended by the Science Committee should be coordinated with him. Senator Schmitt added that NASA senior management is aware that there is a coordination issue and it is being addressed. The recommendation from the Council will assist in that process. Dr. Kennel stated that the overall view is that the definition of the goals for lunar science will be evolving over 18 months, and there should be good contact and coordination with ESMD from the very beginning.

[To avoid any perception of conflict of interest, Dr. Logsdon recused himself from the following discussion on international participation.]

The Science Committee recommended that international partner participation in the robotic aspects should be encouraged. Until the critical path issues are better defined on the human side, it is premature to take up international participation on that aspect. Senator Schmitt noted that NASA, through the Administrator, has stated the intent to encourage international partnerships, but at this point, there is not enough definition of the critical path to know what that international participation could be. The Committee suggested that the NRC be encouraged to invite international observers to its study. On a broader scale, the Committee recommended that international participation in the exploration of the Moon be encouraged within the context of the aims of the United States. There is a successful model for the management of a flotilla of international spacecraft going to the same object in space: the Interagency Consultative Group (IACG) model from Halley's Comet and the international Sun-Earth program. These groups were very effective in coordinating and leveraging the science of existing and planned missions of several nations, and the Committee recommended that NASA look at the IACG as a possible model. Dr. Longnecker suggested that the statement regarding premature international participation in the human exploration program be eliminated from the recommendation, as it tends to have a negative tone. Senator Schmitt agreed that the wording would be re-crafted to something that the Council could agree on.

[Dr. Logsdon returned to the meeting room when the discussion on international cooperation concluded.]

Dr. Fisk commented that NASA is "charging the line," and may not know what to do next. What will we do when we are there? Whatever it is, it must be part of the broader, longer journey to the Moon, Mars, and beyond. One of the stakeholders that must be brought on board is the broader science community that can use the Moon in some way. The NRC/Space Studies Board (SSB) study should be a major event that reaches out to the broad science community to talk about what is possible. It should be the report on record about what the science community wants to do. This was not done with the International Space Station or the Space Shuttle, and as a result the foundation in the science community wasn't there. The constituent base for the Moon should be built from the very beginning. Other

stakeholders should also be part of the process and committed to the long term. Dr. Kennel agreed with Dr. Fisk, and noted that there is an equally large task within NASA to bring together the science, engineering, and exploration community in a much more integrated way. Senator Schmitt commented that in 1960, this process started for Apollo with an Academy study and NASA workshop. The Woods Hole workshop was held in 1965, at which there was engineering participation and an estimate of what could be done within the engineering constraints of Apollo. This led to the lunar sample collection and field geology effort and the scientific packages deployed on and around the Moon during Apollo. He noted that there is not a representative of the lunar sample community on the Committee. Dr. Kennel indicated that the Subcommittees would include those representatives. He emphasized that the planning should involve the various communities from the earliest phase.

Dr. Kennel reviewed the next steps for the Science Committee. Appointment of the Subcommittees is urgently needed; particularly appointment of Chairs, and, prior to the May Council meeting, the Science Committee should meet with those Chairs. Dr. Levy indicated that the Planetary Protection Advisory Committee is scheduled to meet in March. July would be a reasonable date to expect input from the Subcommittees on the Science Plan and the budget. Another large issue within the science community that will need continual examination is the James Webb Space telescope (JWST). The members of the Science Committee should hear the independent program assessment this spring. At the May meeting, the Science Committee would like to review the status of the present Robotic Lunar Exploration Program.

Mr. McPherson encouraged the group to look at partnering and teaming to produce solutions without expenditure of a lot of capital. Dr. Kennel agreed that the science groups have a history of seeking synergy with other organizations. The opportunities for collaboration are unique to each subject. With respect to the JWST review, he stated that if there is more than one program assessment on JWST, the Science Committee wants to hear about them.

Dr. Kennel agreed to work with the Council to draft language for the formal recommendations.

Exploration Committee Report and Discussion

Gen. James Abrahamson, Chair of the Exploration Committee, reported on that Committee's activities. He thanked the key members of the NASA team who have supported all of the Exploration Committee efforts. The Committee has held several fact-finding meetings, including a limited trip to the Kennedy Space Center (KSC). The Exploration Committee was impressed by the architectural planning that is on the way to developing programs and an infrastructure that can successfully execute the President's Exploration Vision. The Committee commended the NASA team for its prudent use of Shuttle hardware and software as the foundation for Exploration that builds on the reliability and validation of systems that only comes from years of repeat usage. It also congratulated the team on realizing that vehicle recovery and reuse is not always the cheapest or most reliable approach. The NASA team was sensitive to the need to build on the strength of the dedicated government and contractor people in the space enterprise. There is natural tension

between building on an experienced workforce, and working to improve systems and introduce more efficient and effective procedures to reduce manpower.

The *ad-hoc* Biomedical Committee has held separate fact finding sessions and reviews of programs and budgets for biomedical research. Gen. Abrahamson indicated that Dr. Longnecker would address this activity. Budgets have been curtailed in the short term, but will need to be enhanced in the longer term for Exploration missions.

Dr. Longnecker discussed the activities of the *ad-hoc* Biomedical Committee. Biomedical science lies in ESMD, while the remainder of the sciences lies in SMD. These need to come closer together as NASA moves forward. The *ad-hoc* Biomedical Committee has reviewed the programs and budgets for the biomedical and life sciences programs that remain in ESMD, through a series of meetings with leaders of the Human Systems Research and Technology (HSRT) programs. The HSRT budget has been decreased by 63% and the remaining programs focus on applied human research to support the short-term essentials of the exploration vision, especially the proposed lunar missions. The Committee understands the budget realities that led to these decisions but notes that almost two-thirds of the deliverables in the Bioastronautics Roadmap are below Countermeasure Readiness Level (CRL) or Technology Readiness Level (TRL) 4, and thus are not funded in the current programs. In order that the long duration Exploration mission objectives are not compromised, NASA will need to develop the resources and relationships to assure that these initiatives receive proper attention and needed support in the near future. The Committee is continuing to explore approaches to facilitate such funding and will report its findings in this area at a future meeting.

Senator Schmitt added that one aspect of the discussions is that the group recognizes the rationale behind the reductions in budgets. However, that doesn't change the reality that in the long term, a great deal of information is needed to address important biomedical issues. Dr. Longnecker noted that there are no earth-orbit flights planned that approximate the Mars flight times. For example, we need to find out whether a partial gravity environment, like the Moon, will abate bone loss.

The presence of the completed International Space Station (ISS) in 2010 creates the most robust general clinical research center for human space research that one can anticipate for several decades. The budget cuts extend not only through the internal NASA family, but also externally into Principal Investigators at major universities and their graduate students and post-docs. The Subcommittee has not heard definitive information on what is being done to address that issue. Dr. Louis Ostrach noted that the grants that were terminated are funded through the end of FY06. Many students and post-docs are involved. Dr. Longnecker commented that this has been one of the concerns of the *ad hoc* Biomedical Committee. The impact in the longer term can be significant. Capt. Hauck asked what percentage of the active research is being terminated, and what percentage impacts the planned research. Dr. Ostrach indicated that he could take an action to get the details on this data.

Dr. Fisk noted that there are aspects of this issue that fall under the SSB. One of the most significant is the loss of a generation of students and researchers in this field. It is measured in the hundreds. There is a special issue with the biomedical field—the very best and brightest don't have to worry about space. There is a lot going on that is not related to space, and they can pursue interests elsewhere. NASA has tried to lure the best and brightest into the space field to solve its problems. There may be an answer in getting the National Institutes of Health (NIH) involved in space research. There is a concern that when the research is actually needed, NASA may not be able to get the best back into the field to solve the problems. Dr. Kennel noted that there has been an enormous investment by NIH, both basic and applied. At what point does the biomedical research program become critical to NASA? This field of study is directly related to safety, and should be at the top of all of the missions. Dr. Schmitt noted that for the initial portion of the mission (lunar), there is probably not a safety issue; however, for extended flights that may require human participation, there are potential safety issues as well as design/engineering issues. If we don't have some seeds planted now and in the fairly near future, it will be difficult for that resource to exist. Dr. Huntress observed that there is a theme emerging—when it comes to science and technological research in NASA, if you want to attract the best and brightest and retain them, there are two requirements: something exciting, and something stable. There are other opportunities for the best and brightest, and if NASA cannot provide stability, they will go elsewhere. Stable research opportunities need to be provided to retain them.

The Council requested that information be provided on how many students and post-docs were affected by the science cuts. Ms. DiGennaro noted that not only is excitement and stability needed, but also the understanding that not everything is "rocket science" and programs and initiatives should be brought down to the average person in the country. NASA needs the support of other sectors and interdisciplinary understanding needs to come to the fore. Ms. DiGennaro wondered if the Congressional committees understand the research that is being affected at their constituents' institutions and she suggested that a subcommittee be formed to look at the interdisciplinary approaches and interagency work that can be initiated to support NASA. She noted that it is not that hard to reach out to those that have not been brought to NASA. Senator Schmitt indicated that he already had some ideas along this line, and would present an approach within the Council structure. Mr. McPherson noted that one part of the solution is to extend the financing term. Private capital can support work and there are ways to access and leverage what dollars NASA has. The key is relationships.

In response to a question about safety from Mr. Maddox, Capt. Hauck commented that in listening to the briefings, it did not appear that safety was being compromised through the early lunar sortie missions. However, the bow wave is being pushed forward and needs to be ameliorated. Dr. Longnecker added that the issue of current safety was never questioned; however, the downstream potential is real. He noted that there is a strong opportunity for NASA to leverage resources, and the Biomedical Subcommittee is looking into this area. Extended spaceflight is associated with apparent suppression of the immune system. This affects cancer biology, HIV, immune system diseases, and a host of infectious diseases. The potential to use the NASA assets as a piece of the collaborations could catalyze something very important.

In relation to the need to maintain human resource levels, Mr. Montelongo noted that resource reductions give rise to risk mitigation strategy. Everyone shares the concern about what happens to real people and the pipeline. A risk mitigation strategy for that pipeline could be developed, e.g., "parking" a talented individual in another agency until funding becomes available.

Dr. Fisk noted that in the FY 2007 budget, there is a rewarding response to the Augustine report on workforce and training. Many agencies benefited from that report. However, the two parts of the NASA budget that is focused on graduate education and training—the R&A Program in space and Earth science, and the biomedical area—saw the biggest cuts. NASA may have lost an opportunity to sell those programs to the nation. Dr. Kennel observed that perhaps NASA could co-invest with other entities for biomedical investment in space. NASA's biomedical program may not have had a close enough connection to the larger biomedical community. Gen. Abrahamson noted that the Exploration Committee is already working on something that will have a focus on efforts to examine how relationships can be worked on not only for the science part of the program, but for the whole Agency. We need to build on this theme and keep the momentum going. The Committee will try to define its piece as carefully as possible, and funnel it into the Human Capital Committee. Senator Schmitt indicated that the Council might have a specific immediate recommendation that NASA see if there is a way to become a participant in the Science, Engineering, and Education Initiative. Dr. Kulcinski indicated that the Human Capital Committee would welcome input and would take it very seriously. Gen. Lyles noted that the President's Commission report recommended that on this issue, the burden not be solely placed on NASA. It suggested that the President charge the Department of Education to take the lead and bring agencies forward to work together. Dr. Griffin might want to use the Commission report to stimulate action. Senator Schmitt indicated that he and Mr. Blackerby would follow up regarding the status. Dr. Milgram added that at the moment, activities are being coordinated under the "competitiveness initiative," but it is not the highest priority at the Department of Education; NASA needs to take the initiative to move forward on this action.

Capt. Hauck indicated that the Exploration Committee has had a number of briefings from Mr. Gerstenmaier and the Space Operations Mission Directorate (SOMD), as well as from Mr. Cooke from ESMD. They appear to be working together, and there is a well-crafted strategy to execute the transition of activities and explore areas where money can be saved and technologies can be shared. Examples include innovative approaches to provide additional monies for the sparing philosophy and a procurement strategy for a transition to the next generation vehicle that will take advantage of contracting mechanisms already in place. One area that the Committee recommended the NASA team focus more attention on is the reduction in buying power by these Directorates caused by the internal taxes applied to the programs, e.g., for Katrina recovery, general appropriation reductions, increases in allocations for the independent technical authority, etc. These reductions may have the consequence of putting strains on programs that could endanger their execution. Perhaps PA&E could be used to determine if the allocation of these reductions will have a deleterious effect on executing the Shuttle Program and transitioning to the future. The

taxes should not fall where they can least be afforded. The Committee needs to continue to examine the process.

Much of the Exploration Committee input has implications for other activities. Many activities will require coordination before an issue comes before the Council. It may be valuable to comment for the record on the Biomedical Committee activity as part of the Exploration Committee, but it needs to be vetted by other groups. Senator Schmitt commented that if some of the Committee sessions need to be a joint effort, he would leave that to the Chairs to organize. With respect to the agenda, he requested that the amount of time the Committees would have at the next meeting be maximized.

Gen. Abrahamson commented on next steps. One area is the commercial involvement in the Exploration initiative. He noted that the Exploration Committee would have some recommendations in that area in the future.

Aeronautics Committee Report and Discussion

Gen. Lyles, Acting Chair of the Aeronautics Committee, reported on the Committee's activities. The Aeronautics Research Mission Directorate (ARMD) has the lowest budget of all of the Mission Directorates. Leveraging, partnerships, and relationships are essential to ensuring that NASA can accomplish missions in the Aeronautics regime. The Committee was very impressed with Dr. Porter and her team, and many of the Committee's concerns are already being addressed. Dr. Porter presented the reshaped plan for Aeronautics. The three principles of the plan are to: 1) dedicate to the mastery and intellectual stewardship of the core competencies of Aeronautics for the nation in all flight regimes; 2) focus the research in areas that are appropriate to NASA's unique capabilities; and 3) directly address the R&D needs of the Next Generation Air Transportation System (NGATS) in partnership with the member agencies of the Joint Planning and Development Office (JPDO). The committee was pleased to see these top principles. Today, the JPDO is very happy that NASA has stepped up to being the research arm for the next generation.

Gen. Lyles briefly discussed how Aeronautics is being re-shaped at NASA. There are many synergies with the Department of Defense (DOD), the Federal Aviation Administration (FAA), and other agencies. Partnerships, leveraging and relationships with others are key to increasing the program's momentum. In response to a question, Gen. Lyles noted that the Committee is just beginning to see the linkages between the ARMD and the ESMD. It heard about the processes that are being set up to make sure coordination and linkages happen. In response to a question, Gen. Lyles indicated that research and test facilities are being re-visited to examine potential linkages with other agencies and future uses. Dr. Alonso noted that starting with this fiscal year, only half of the funding for those facilities would be provided by ARMD; Headquarters will provide the other half. Senator Schmitt noted that the industrial base and intellectual base for thermal protection systems is absent and needs to be rebuilt. Gen. Lyles took an action for his Committee to look at facilities and linkages in this area and report back to the Council.

Gen. Lyles indicated that the Committee was happy to see the emphasis on defining requirements and needs, as well as on working with industry and universities. The

Committee has been very concerned about university partnerships. ARMD is opening the horizon to a broader set of universities and colleges. The Committee has suggested that ARMD reach out to everyone it possibly can, e.g., take advantage of the Annual Black Engineer of the Year in Baltimore next week. Internally, NASA should make sure that there is good coordination between the various Mission areas and the outreach programs of NASA. Dr. Colladay noted that one of the features of NACA was how industry worked with the research centers in a collaborative relationship. It didn't depend on money changing hands, but was an intellectual partnership. NASA needs to be encouraged to work with industry in the way that it did in the NACA days. There needs to be more outreach in developing that partnership. This goes back to one of the actions taken yesterday on intellectual property. Industry needs some assurance that if it brings its best ideas to the partnership, NASA will protect that property. The Aeronautics Program needs to devote some attention to working this issue. Gen. Lyles suggested that the Council also put some attention on the technology transition aspect. Mr. Stanislawski added that the contractual mechanisms can affect how willing industry is to enter into partnerships. He suggested that the Aeronautics Committee also look at this area. In response to a comment from Senator Schmitt, Dr. Colladay agreed that there should be a thoughtful look at what features of NACA should be emulated. The Mission Directorate people need to be more involved in the outreach program.

ARMD is already well into its four-step planning process. A series of workshops have been conducted for each project in each program, and a Request for Information has been used to solicit interest from industry to collaborate at the system level. Gen. Lyles showed the timeline for activities in 2006, leading to contract awards in the September timeframe. He agreed that the Committee needs to look at contracting mechanisms. Gen. Lyles was pleased to see a breakdown of research activities that need to be addressed in hypersonics. The activities link to what NASA or other agencies need within the aeronautics regime. The Chair of the JPDO has stated that NASA has already reshaped the Aeronautics Program to accomplish NGATS research goals.

In general, there has been a refreshing new look at Aeronautics, and there is a logical plan for use of talent and resources. The Committee commended the adjustment of priorities in support of JPDO and NGATS, as well as the actions to secure the sustainable future of test facilities. However, significant constraints result from steadily decreasing budget allocations, and there is a clear risk of continued erosion of fundamental capabilities in fundamental aeronautics, safety, airspace systems, and test programs. Senator Schmitt noted that there must be repetitive articulation to Congress and OMB on the importance of NASA's Aeronautics Research Program.

Dr. Kennel asked whether this program is able to play a role in the stewardship of talent flow in aeronautics. Dr. Lyles answered in the affirmative and noted that Dr. Porter also believes that. He indicated that the Committee could make some recommendations along those lines. The Committee recommended that NASA provide high-level support for substantive interactions and leveraging between the NASA Aeronautics Program and other government agencies (Air Force, Army, DARPA, Navy). These interactions need to be fostered at all levels, particularly the engineering staff levels. The Council can help ensure

that the interactions are at the right levels. With respect to the re-shaped research portfolio, the Committee recommended that NASA protect key areas of expertise and key personnel, and ensure that a broad set of independent experts regularly conduct program and project reviews. This will ensure depth and significance to the NASA mission. Continuity is critical to the success of this program.

Gen. Lyles reviewed the Aeronautics Committee's future plan. The Committee will assist in facilitating Aeronautics partnerships with Air Force, Army, DARPA, and universities. Prior to the next Council meeting, the Committee will review specific Air Force Research Laboratory aeronautics research programs. It will review the on-going "Decadal Study on Civil Aeronautics" by the NRC Aeronautics and Space Engineering Board. The Committee will also review and comment on the planning for a National Aeronautics Policy. Dr. Porter is working to establish a framework for this National Aeronautics Policy. Dr. Colladay remarked that industry should also be included as one of the partnerships that will be facilitated by the Committee.

Gen. Abrahamson commented that he was pleased to see the ARMD in a close relationship with other agencies, particularly the FAA. Gen. Lyles agreed that the relationship between NASA and FAA could not be better.

Audit and Finance Committee Report and Discussion

Mr. Robert Hanisee, Chair of the Audit and Finance Committee, reviewed the Committee's activities and upcoming plans. Members of the Committee include Mr. McPherson, Mr. Montelongo, and Mr. Stanislawski. Mr. Hanisee commented that at some point in the past, the NASA financial management system got off track. The Agency had unqualified audit reports through 2000. In the first year of Price Waterhouse's audit (2001), NASA received a failed audit report. In 2002, NASA received an "unqualified" statement, but the auditors had to do a lot of work to make that grade. In 2003, Price Waterhouse issued a disclaimer. Ernst and Young (E&Y) has done the books for the past two years, and disclaimers were issued for 2004 and 2005. The Inspector General (IG) Report to the House Science Subcommittee cited persistent internal control weaknesses. It stated that NASA lacks the systems, processes, and human capital to produce creditable estimates. The Committee first of all needed to understand the problem, which has required a substantial amount of fact finding that is still ongoing. The goal for NASA is to achieve sufficient internal controls and data integrity. To merit a clean financial audit opinion, the books must be in balance with the Treasury, property accounting issues must be resolved, and timely and accurate financial reporting must be provided.

The Committee is still defining its work statement. Initial efforts involved a couple of conference calls with the CFO and her staff. On February 8, there was an intensive session with the IG office, E&Y and various members of Office of CFO (OCFO) personnel. Among the issues reviewed were: contract cost accounting and management (creditable cost estimates, estimate to completion updates and adjustments, and control of program costs); property, plant, and equipment materials accounting (those that are NASA controlled, those at contractor facilities, and the standards for capitalization and depreciation); NASA owned aircraft (the number of aircraft and cost benefit, the proper allocation of costs, and full cost

accounting); environmental liability estimating (this cuts across many organizations within the Agency); and reconciling the difference between the Agency books and the fund balance with Treasury. Mr. Hanisee stated that none of these things are hard. Fixing the problems should be straightforward and will require implementation of good systems and practices, discipline, and proper training of personnel. Significant progress has been made in balancing the books with Treasury.

The Committee discussed the causes of the Agency's accounting problems. The causes are rooted in Centers that have historically operated with a high degree of autonomy—there were 10 different accounting systems and 120 subsystems. A significant part of the current problems is rooted in unreliable historical data. This is a harder problem to resolve, but the CFO is tackling this and there is a solution in sight. Training of personnel is not uniform throughout all of the cost centers. The Committee is recommending that it have an opportunity to meet with the head of the accounting system at each Center. At heart, there must be an accounting system that is reliable and captures transactions reliably as they occur. In addition a system of controls needs to be set up behind the accounting system to catch mistakes.

Mr. Hanisee summarized the Committee preliminary findings: 1) the problems are fixable; 2) progress is being made; 3) there is some "low hanging fruit," e.g., the environmental liability accounting problem should yield to better communications between the involved parties and better focus from senior management; and 4) attitude has changed, and the financial/accounting staff is taking responsibility. Senator Schmitt asked if there were any issues with the new integrated financial management system, and Mr. Hanisee responded that the Committee has not yet had an opportunity to delve deeply into this, but will take on this action.

The Committee had the following specific preliminary recommendations: 1) consider having Center level financial personnel report up through the OFCO rather than the Center Director; 2) involve other groups in the solution, e.g., only 3 of the 45 deficiencies noted by GAO are the direct responsibility of OCFO; 3) create a process of regular communication between OCFO and the Office of Environmental Management; and 4) have the Center financial personnel present to the Audit and Finance Committee at future Council meetings.

Dr. Katz addressed the first recommendation of having Center level financial personnel report through the OCFO as well as the Center Director. The Center needs to have some accountability. Regarding the second recommendation, Senator Schmitt requested that Mr. Blackerby find out more about who has the responsibility for the other 42 deficiencies. Mr. Montelongo noted that the focus at NASA has been on budget—getting funds from Congress, rather than accounting. It is critical that the Chief Executive (Dr. Griffin) be actively involved in getting everyone on the same page. Mr. Hanisee concluded his report by stating that these problems can and must be fixed. NASA's credibility in dealing with the White House and Congress is critical to its future. The Committee will do whatever it can in working with the OCFO and others to make this happen.

Mr. Hanisee stated that the first three recommendations are ready to be taken forward, with the modification suggested by Dr. Katz (substitute "as well as" instead of "rather than"). Senator Schmitt indicated that he would work with Mr. Hanisee on the wording of the second recommendation. The Committee will ensure that action is taken on the fourth recommendation in the future.

Mr. McPherson agreed that these problems are fixable and the scale is manageable. He cited another organization that in one year went from a disclaimer to a clean report. It takes senior management attention and expectation of excellence in this area of endeavor. Dr. Griffin has changed his view of running the enterprise from Centers to programs and projects. The importance of a clean audit report cannot be underestimated. Senator Schmitt noted that he would get the "line of business" chart to all of the Council members. The Council is acting to a significant degree as a Board of Directors. That is clearly shown with the Audit and Finance Committee. Mr. Stanislawski added that the Committee has been very impressed with the people with whom it has met. Nevertheless, there is a lot of resistance within the bureaucracy that needs to be overcome. Mr. Montelongo noted that it would be very helpful to the accounting and finance people if their activity was recognized as one of extreme importance to the Agency.

Gen. Abrahamson asked how many of the OCFO's staff really come from a business background as opposed to a government background. Mr. McPherson indicated that there is a mixture; many in the group have private industry experience. NASA has hired about 30-35 people in this area within the last 6 months. The key is to have adequate controllers at the Centers. Mr. Hanisee added that training is a large part of the corrective program. Many of the people would like to do things right, but lack the skill sets. NASA has a lot to "sell" and should not have difficulty in attracting talent. Mr. Montelongo commented that in addition to getting the skills upgraded, the internal audit function needs attention. In the past, the focus has not been on internal audits of financial statements. Dr. Kennel observed that for program and project managers, financial obscurity is often a defense against the puts and takes of the political and budget processes. If there is transparency, contingency will be visible and managers' internal flexibility would be decreased.

Human Capital Committee Report and Discussion

Dr. Kulcinski, Chair of the Human Capital Committee, reported on the Committee's activities. Most of the information that this Committee needed to do its particular task is in the process of being prepared. Dr. Kulcinski noted that because the information is just now coming to the Committee, its recommendations are preliminary. Three reports are being or will be analyzed: the Workforce Strategy report; the interim report on Aerospace Science and Engineering Workforce from the NRC/SSB/ASEB; and the results of the Systems Engineering and Institutional Transition Team study on the NASA workforce. The Augustine effort will be the fourth leg. The Committee will have an interim meeting in April or May, and this meeting will be used to expand and finalize the preliminary recommendations.

While recognizing the sensitivity and political ramifications of personnel reductions at the Centers, the Committee believes that the Agency must have the authority to rebalance the

workforce to reflect the skills required for the Vision for Space Exploration. This rebalancing should be accomplished relatively quickly to contain the inevitable disruption in the recruitment of young, talented scientists and engineers for the future NASA workforce.

Dr. Kulcinski presented the Committee's overarching preliminary recommendation: NASA should increase its collaboration with the Department of Education and other Federal agencies, as well as its industrial and academic partners, to align with the President's Competitiveness Initiative to address the needed and critical expansion of the pool of better educated students in math and science. NASA must assure that its educational programs and workforce recruitment support and target this nation's top achievers in math and science.

Dr. Kulcinski followed with other preliminary recommendations from the Committee: NASA needs to develop a strategy to tap into the current science and engineering workforce to provide the proper talent mix to address the near term problems and eliminate barriers to the flow of government-industry-academia technical staff; and NASA should more aggressively pursue the attraction of the best and brightest K-16 students to join NASA or NASA-related industry to have a major effect on the post 2010 workforce. Mr. Montelongo noted that DOD uses "role models" in recruiting, and this is a powerful influence. Ms. DiGennaro noted that students that have gone through special programs are not choosing NASA as a place they would like to work. The excitement is in NASA, but it is not being transmitted to the public. The Education Division should reassess its process of providing grants to schools and universities. The granting process must encompass a focus on recruiting the most talented students. It is important that NASA strive to get the top science and engineering students and there must be a more creative way to induce top achievers into the Agency.

Gen. Lyles noted that the Air Force instituted a program of retaining engineers, working with every engineer at a young age, noting their concerns, career paths, etc. to retain them for the Air Force. This model might be something that NASA would want to look into. Dr. Kulcinski indicated that the Committee would consider putting that into its future recommendations. Senator Schmitt indicated that he would get a printout of the syllabus for a recent multidisciplinary course that would be useful for NASA to consider. In response to comments from Dr. Robinson, Senator Schmitt agreed that the near term issue for the Committee is the bottleneck. Dr. Levy added that the consequences of the bottleneck will continue for a long time, and it would be worthwhile to look into ways to alleviate it. Dr. Kulcinski indicated that there are three bills being introduced in the Senate. The first one deals mostly with the Dept. of Energy; the second bill is for several hundred million dollars and has many other agencies, including NASA and DOD. The third bill includes NSF, NASA, and DOD and addresses funding for students and early career grants. The Committee needs to get more information on this. Dr. Kennel recommended that the Council take a proactive position relative to these bills. Senator Schmitt indicated that he would try to find out more about them.

Recognizing that NASA does not dictate national immigration policy, Dr. Kulcinski noted that it is nonetheless important to revisit the present policy of blanket exclusion of non-US scientists and engineers from working at NASA Centers. Roughly half to two-thirds of the

advanced degree graduates in the US are non-US citizens. Dr. Kulcinski indicated that the Committee would work through this recommendation. Mr. Stanislawski noted that there are several levels to this issue, e.g., security clearance and export control. Export control can be worked, but the clearance issue is tougher to get over. Dr. Kulcinski observed that green cards are getting harder to obtain. This issue will be important, and the Committee will take a look at it and come back with some recommendations. The Committee will digest the two NASA reports and the one NRC report, meet in April to update the preliminary recommendations, continue discussions with NASA workforce personnel, and correlate the human capital activities with other Council Committees to make sure that crosscutting human capital issues do not get lost. Senator Schmitt asked Dr. Kulcinski to coordinate directly with other Committee Chairs.

Gen. Abrahamson commented that it is important to get across to young people and their parents what NASA's programs mean to the nation. NASA needs this long-term support. He recounted NASA's former secondary school involvement program, where students got first-hand experience with the Shuttle program. Ms. DiGennaro asked if the Committee could interface more directly with the Education people at NASA regarding what is going on now, what is planned, and whether they are going in the direction that the Committee is proposing. Senator Schmitt agreed that this is important and should be pursued. He added that the Council would explore the possibility of an *ad hoc* committee or subcommittee to look into outreach. Dr. Kulcinski noted that there is a problem with retention of students in engineering schools. A lot of good students go one or two years in engineering, then transfer to another school or drop out. Ms. DiGennaro added that the Committee should look at the prize program. The prizes may not be leveraged as much as they could be. As the Council continues its review of prizes, there is an interface with the Human Capital Committee.

Senator Schmitt indicated that the minutes, presentations, and recommendations will be posted on the Council Website. Comments should be directed to the Executive Director, Mr. Blackerby. The next meeting will be May 17-18, at JPL.

Senator Schmitt adjourned the meeting at 3:25 p.m.

NASA Advisory Council
Meeting Agenda
Washington, DC
February 8-9, 2006

Meeting Location
Ronald Reagan Building and International Trade Center
Hemisphere A Conference Room
1300 Pennsylvania Ave. NW
Washington, DC

Wednesday February 8

2:00 pm	Welcome and Administrative Announcements	Hon. Harrison H. Schmitt
2:15 pm	Overview and Discussion of Program Analysis and Evaluation	Dr. Scott Pace Associate Administrator Program Analysis & Evaluation
3:45 pm	Break	
4:00 pm	Overview and Discussion of Commercial Opportunities and the Vision for Space Exploration	Mr. Brant Sponberg Acting Program Executive Innovative Procurements Constellation Systems Exploration Systems Mission Directorate
5:00 pm	Adjourn for the day	

Thursday, February 9

8:00 am	Science Committee Report & Discussion	Dr. Charles Kennel
9:30 am	Break	
9:45 am	Exploration Committee Report & Discussion	Gen. James Abrahamson
11:30 am	Lunch	
12:30 pm	Audit and Finance Committee Report & Discussion	Mr. Robert Hanisee
2:00 pm	Break	

2:15 pm	Aeronautics Committee Report & Discussion	Gen. Lester Lyles
3:15 pm	Human Capital Committee Report & Discussion	Dr. Gerald Kulcinski
3:45 pm	Summary	Hon. Harrison H. Schmitt
4:00 pm	Adjournment	

NASA Advisory Council Members
Attendance at Meeting
February 8-9, 2006
Total Attendance: 24

Chair	• Hon. Harrison H. Schmitt, Apollo 17 Astronaut and Scientist
Aeronautics Committee	• Acting Chair*:* General Lester L. Lyles, USAF (Ret.), Consultant, The Lyles Group • Dr. Juan J. Alonso, Department of Aeronautics & Astronautics, Stanford University • Dr. Eugene E. Covert, T. Wilson Professor of Aeronautics, Emeritus, Department of Aeronautics and Astronautics, Massachusetts Institute of Technology
Audit and Finance Committee	• Chair*:* Mr. Robert M. Hanisee, Trust Company of the West • Hon. Edward R. "Ted" McPherson, Chief Executive, InterSolve Group, Inc. • Hon. Michael Montelongo, Senior Vice President, Strategic Marketing, Sodexho Inc. **(*Note: Not attending on February 8)*** • Mr. Howard J. Stanislawski, Partner, Sidley Austin Brown & Wood, LLP
Exploration Committee	• Chair*:* Lieutenant General James A. Abrahamson, USAF (Ret.) • Capt. Frederick (Rick) Hauck, USN (Ret.) • Dr. John M. Logsdon, Director, Space Policy Institute, George Washington University • Dr. Stephen I. Katz, M.D., Ph.D., Director, National Institute of Arthritis and Musculoskeletal and Skin Diseases
Human Capital Committee	• Chair*:* Dr. Gerald L. Kulcinski, Associate Dean for Research, College of Engineering, University of Wisconsin-Madison • Ms. Joann DiGennaro, President, Center for Excellence in Education • Ms. Kay Coles James, Consultant • Mr. Wendell Maddox, President and Chief Executive Officer, ION Corporation • Dr. R. James Milgram, Professor, Department of Mathematics, Stanford University
Science Committee	• Chair*:* Dr. Charles F. Kennel, Director and Vice Chancellor of Marine Sciences, Scripps Institute if Oceanography • Dr. Wesley T. Huntress, Jr., Director, Geophysical Laboratory, Carnegie Institution of Washington • Dr. Eugene H. Levy, Provost and Professor of Physics and Astronomy, Rice University • Dr. Mark S. Robinson, Research Associate Professor, Department of Geological Sciences, Northwestern University
Ex-Officio	• Dr. Raymond S. Colladay, Chair, Aeronautics and Space Engineering Board, National Research Council • Dr. Lennard A. Fisk, Chair, Space Studies Board, National Research Council • Dr. David Longnecker, Chair, Committee on Aerospace Medicine and Medicine for Extreme Environments, Institute of Medicine, National Research Council
Unable to Attend	• Mr. Neil Armstrong, Apollo 11 Astronaut • Dr. Neil DeGrasse Tyson, Frederick P. Rose Director, Hayden Planetarium, Department of Astrophysics, American Museum of Natural History

NASA ADVISORY COUNCIL
Ronald Reagan Building and International Trade Center
Washington, DC
February 8-9, 2006

MEETING ATTENDEES

Council Members:

Schmitt, Harrison, *Chair*	Aerospace Consultant
Abrahamson, James	USAF (Ret.), Aerospace Consultant
Alonso, Juan	Stanford University
Blackerby, Christopher, *Executive Director*	NASA Headquarters
Colladay, Raymond, *Ex-Officio*	Aeronautics and Space Engineering Board
Covert, Eugene	Massachusetts Institute of Technology
DiGennaro, Joann	Center for Excellence in Education
Fisk, Lennard, *Ex-Officio*	Space Studies Board
Hanisee, Robert	Trust Company of the West
Hauck, Frederick (Rick)	USN (Ret.)
Huntress, Wesley	Carnegie Institute of Washington
James, Kay Cole	Consultant
Katz, Stephen	NIAMSD, National Institutes of Health
Kennel, Charles	Scripps Institute of Oceanography
Kulcinski, Gerald	University of Wisconsin-Madison
Levy, Eugene	Rice University
Logsdon, John	George Washington University
Longnecker, David, *Ex-Officio*	Institute of Medicine
Lyles, Lester	USAF (Ret.), Consultant
Maddox, Wendell	ION Corporation
McPherson, Edward	Intersolve Group, Inc.
Milgram, R. James	Stanford University
Montelongo, Michael	Sodexho, Inc.
Robinson, Mark	Northwestern University
Stanislawski, Howard	Sidley Austin & Wood

NASA Attendees

Akst, Elaine	NASA Headquarters
Bauer, Robert	NASA/GSFC
Beasley, Dolores	NASA Headquarters
Boggs, Susan	NASA Headquarters

Bowman, Ron	NASA Headquarters
Cleave, Mary	NASA Headquarters
Cooke, Doug	NASA Headquarters
Dakon, Kathy	NASA Headquarters
Dautzler, Andy	NASA Headquarters
Davidson, Ken	NASA Headquarters
Edgington, Stacey	NASA Headquarters
Gerstenmaier, Bill	NASA Headquarters
Gilchrist, Rebecca	NASA Headquarters
Griffin, Michael	NASA Headquarters
Hartman, Colleen	NASA Headquarters
Hertz, Paul	NASA Headquarters
Horowitz, Scott	NASA Headquarters
Howard, Rick	NASA Headquarters
Kaye, Jack	NASA Headquarters
Kellum-Cloman, Kamaron	NASA Headquarters
Kiezel, Jon	NASA Headquarters
King, Marla	NASA Headquarters
Kirkham, Gib	NASA Headquarters
Komar, George	NASA Headquarters
Leshin, Laurie	NASA/GSFC
Lomax, Terri	NASA Headquarters
Maizel, Roy	NASA Headquarters
Mathews, Melissa	NASA Headquarters
McCuistion, Doug	NASA Headquarters
McGrath, Melissa	NASA Headquarters
Morse, Jon	NASA/GSFC
Mulville, Dan	NASA Headquarters
Ostrach, Louis	NASA Headquarters
Pace, Scott	NASA Headquarters
Pollitt, Julie	NASA Headquarters
Porter, Lisa	NASA Headquarters
Ralsky, Michael	NASA Headquarters
Risher, Richard	NASA Headquarters
Roahr, Debbie	NASA Headquarters
Rouf, Joan	NASA Headquarters
Rummel, John	NASA Headquarters
Simpson, Jerry	NASA Headquarters
Smith, Eric	NASA Headquarters
Sponberg, Brant	NASA Headquarters
Walton, Amy	NASA Headquarters
Williams, Greg	NASA Headquarters

Other Attendees

Bardos, Russ	Spacehab
Barnes, Dick	[consultant]
Bavailler, Stephanie	Licorne Films
Beckman, Bill	Boeing
Block, Don	Raytheon
Bruno, Michael	Aerospace Daily
Brzenezinski, Frank	Raytheon
Cowing, Keith	NASA Watch
Dineram, Tayloe	WSS Space Review
Ebbets, Dennis	Ball Aerospace
Eckardt, Derrick	Boeing
Frankel, Paula	Consultant
Freeman, Marsha	20th Century Magazine
Freir, Harrison	Northrop Grumman
Garver, Lori	DFI
Gibbs, Graham	ESA
Glynn, Bridget	Lewis-Burke Assoc.
Harrison, Steve	Northrop Grumman
Hays, Linda	SETI Institute
Hill, Pete	Raytheon
Hoffman, Allen	Boeing WDCO
Jubinsky, Michael	Perot Systems
Kohut, John	Raytheon
Lane, Carol	Ball
Leary, Warren	The New York Times
Malay, Jon	Lockheed Martin
McCoy, Joanne	GD C4S
Moffry, Charles	DFI International
Murrow, Dave	Ball
O'Hana, Mike	Aerojet
Pal, Rajib	Sidley Austin
Peterson, Chris	SRI
Pryke, Ian	GMLI
Reichhardt, Tony	Nature, Air & Space
Rohacik, Jim	GD
Schaffer, Audrey	GWU SPI
Shibukawa, Kiwao	JAXA
Simpson, Ted	*[self]*
Teffell, Kim	[self]
Treat, David	GWU SPI
Trepod, Allison	SRI
Walker, Charles	*[self]*

NASA ADVISORY COUNCIL
Ronald Reagan Building and International Trade Center
Washington, DC
February 8-9, 2006

LIST OF PRESENTATION MATERIAL[1]

1) Program Analysis and Evaluation [Pace]
2) Commercial Opportunities in the Vision for Space Exploration [Sponberg]

Other Material Distributed to the Council:

1) Presenters' Biographies
2) NASA Advisory Council Meeting Minutes, November 29-30, 2005
3) Charter of the NASA Advisory Council

[1] Presentation and other material distributed at the meeting is on file at NASA Headquarters, OER/ACMD, 300 E Street SW, Washington, DC 20546.